

AGU Annual Conference
San Francisco, CA; December 4th 2012

Temporal and Spatial Distributions of Volatile Organic Compounds Associated with Oil and Gas Development in the Upper Green River Basin of Wyoming

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UNIVERSITY OF WYOMING





Wyoming

Oil & Gas Conservation Commission

Pinedale Anticline

Jonah Field



miles
km

40

60

Google earth

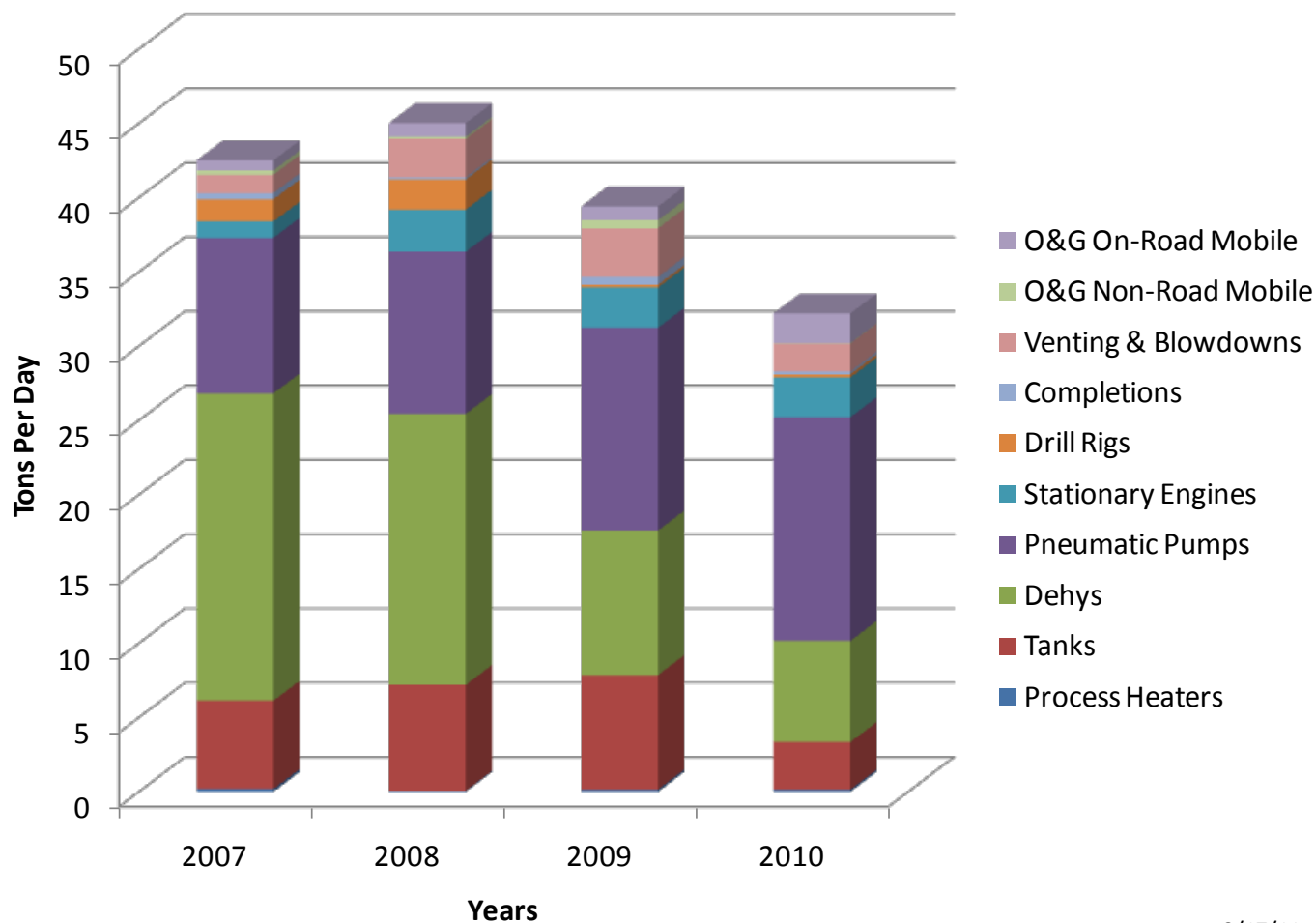


Emissions of Volatile Organics

Note: Fugitives and emissions from truck loading excluded



**Sublette County Winter Inventory
Daily VOC Emissions**



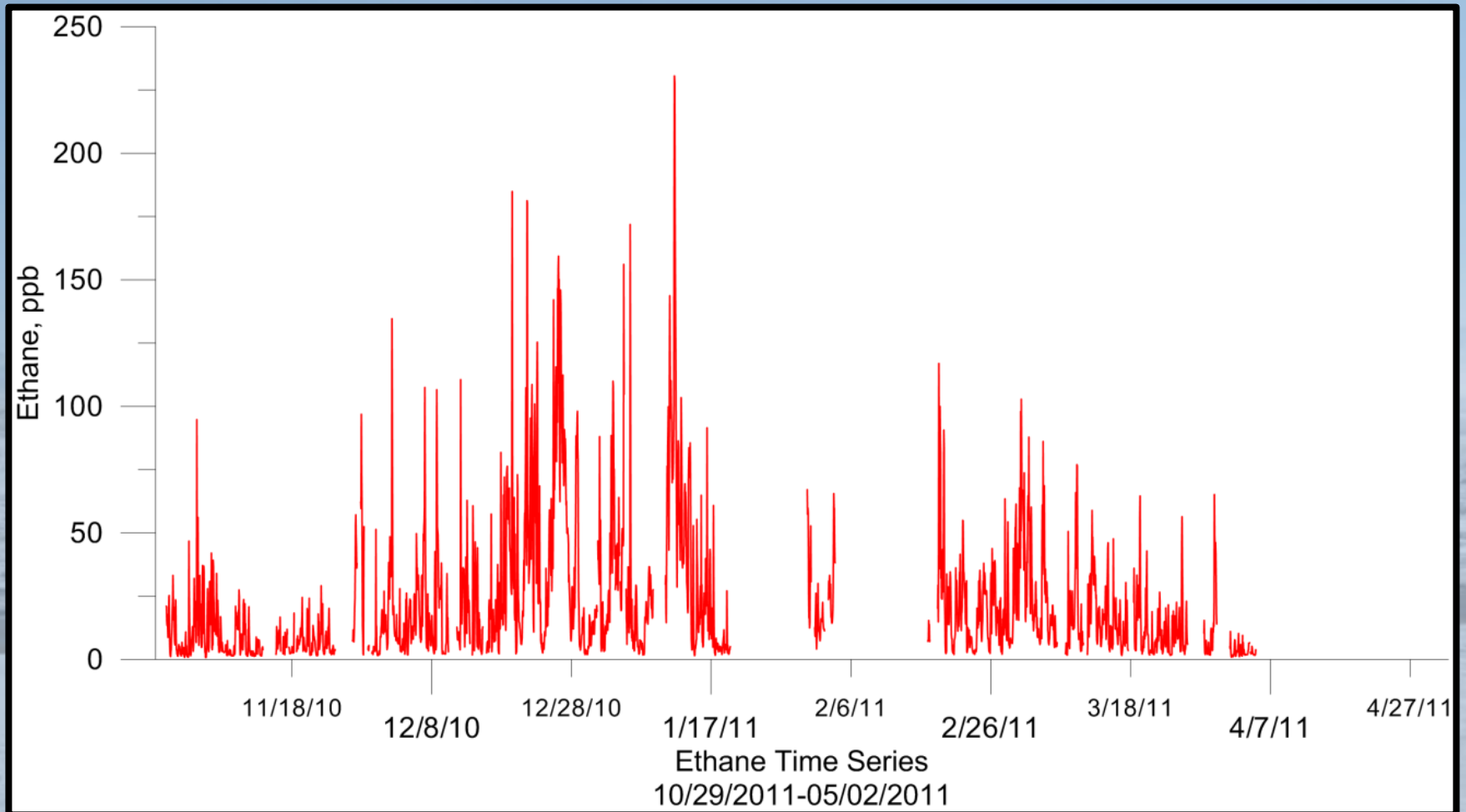
UW VOC Measurements

- **Temporal UW BSR**
 - Continuous at station
- **Spatial UGRB**
 - Discontinuous diffusive and canister sampling



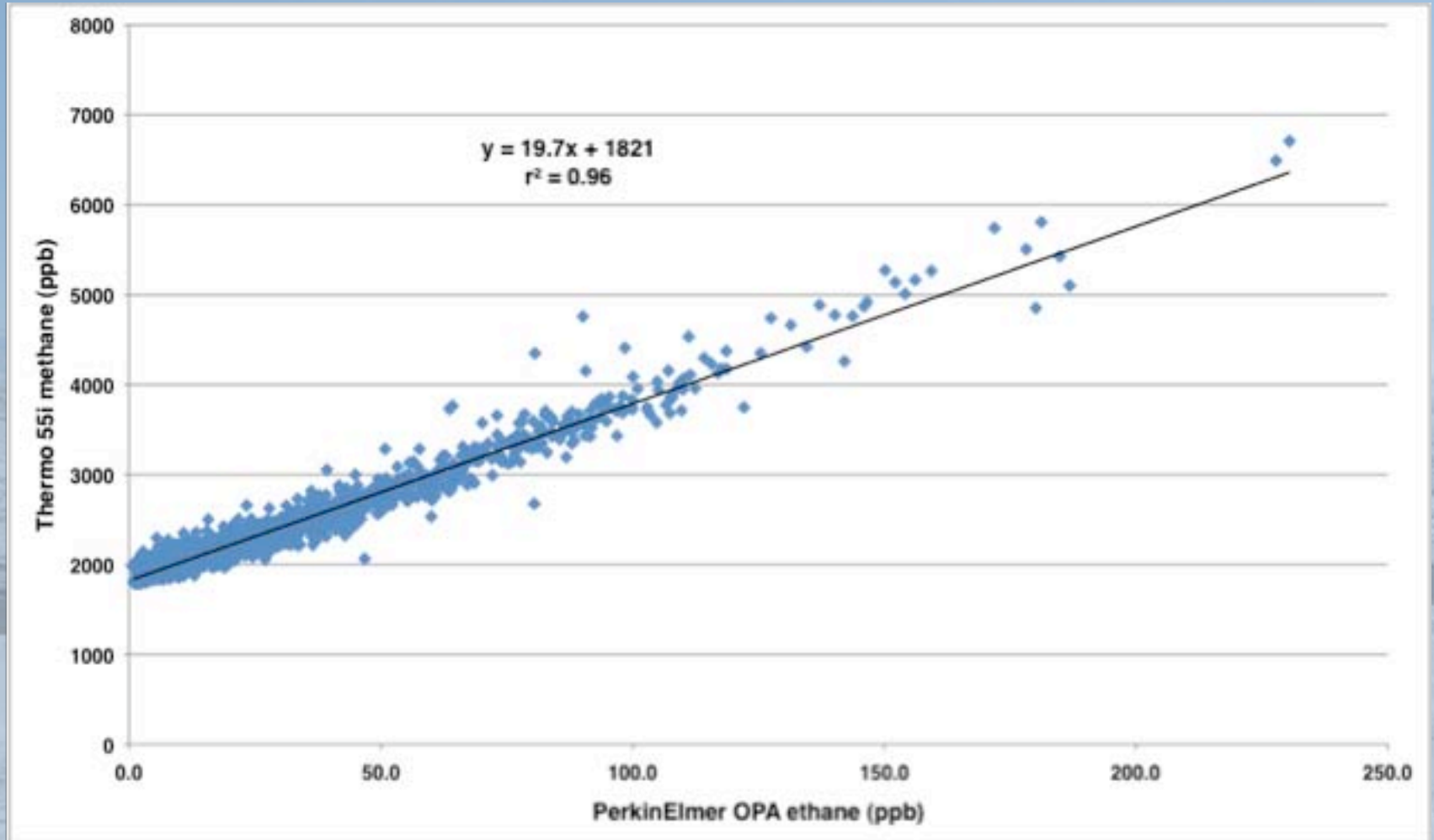
Ethane at UW BSR

Nov. 2010 to Apr. 2011

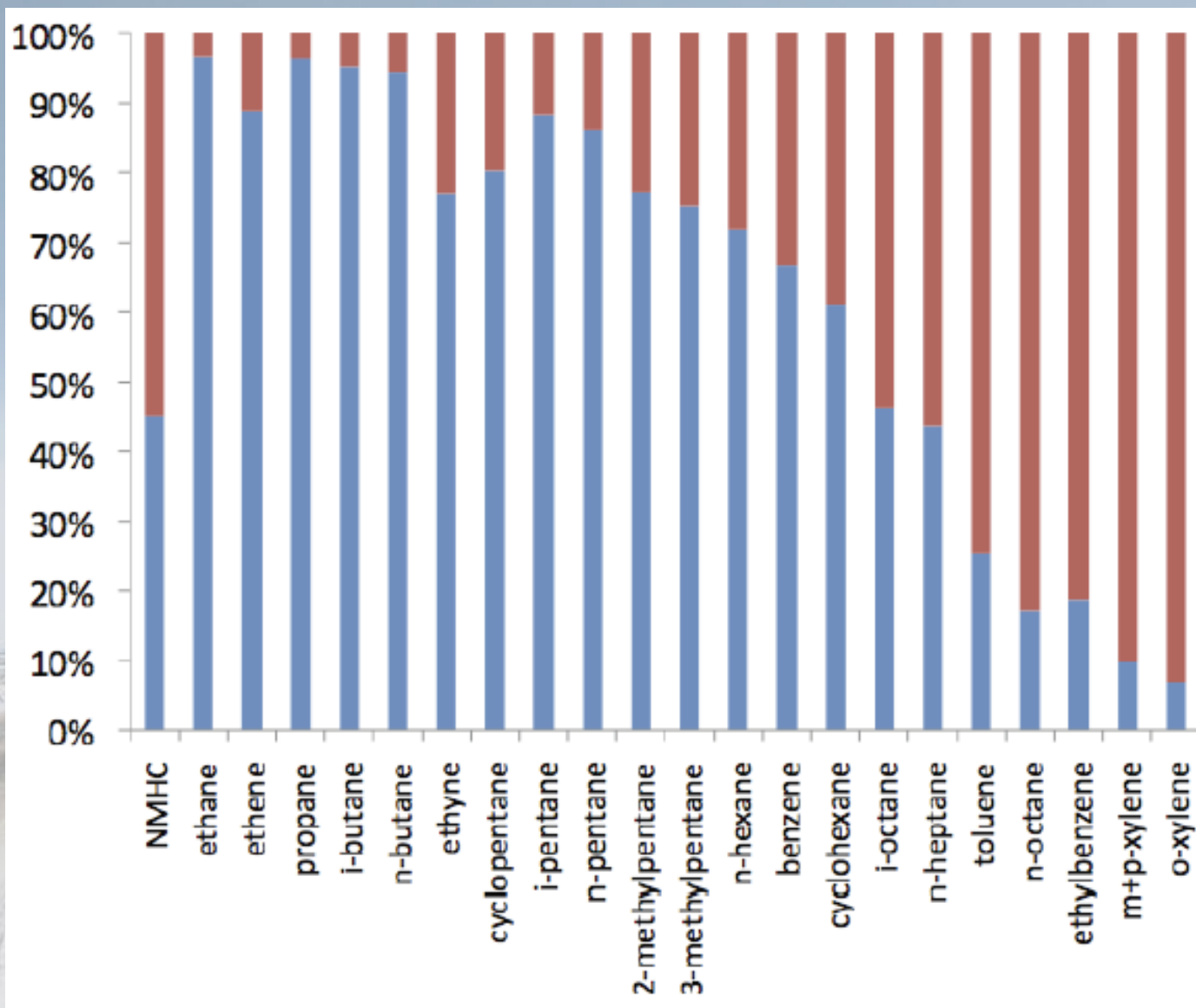


Methane vs. Ethane

UW BSR Nov. 2010 to Apr. 2011

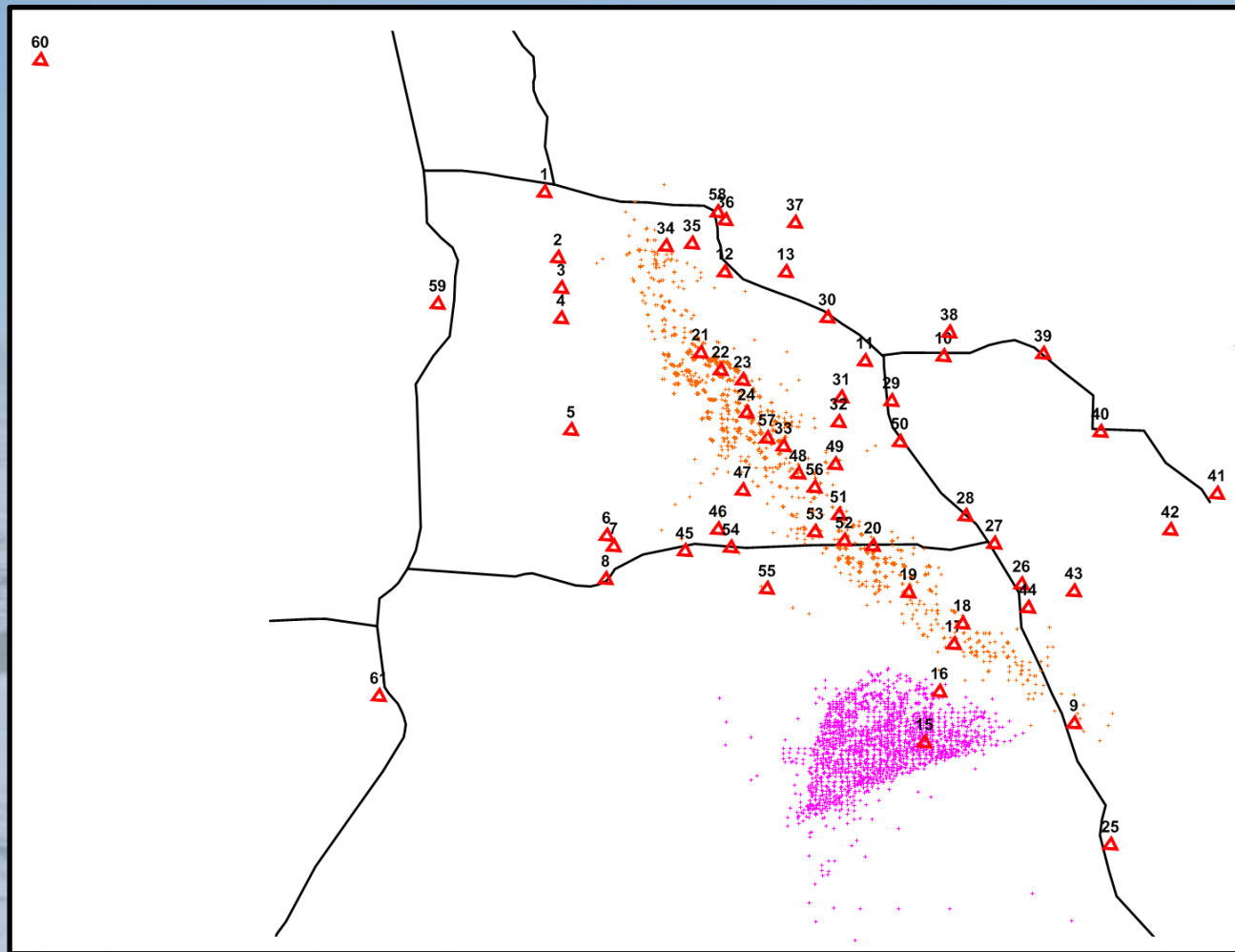


PMF Analysis UW BSR

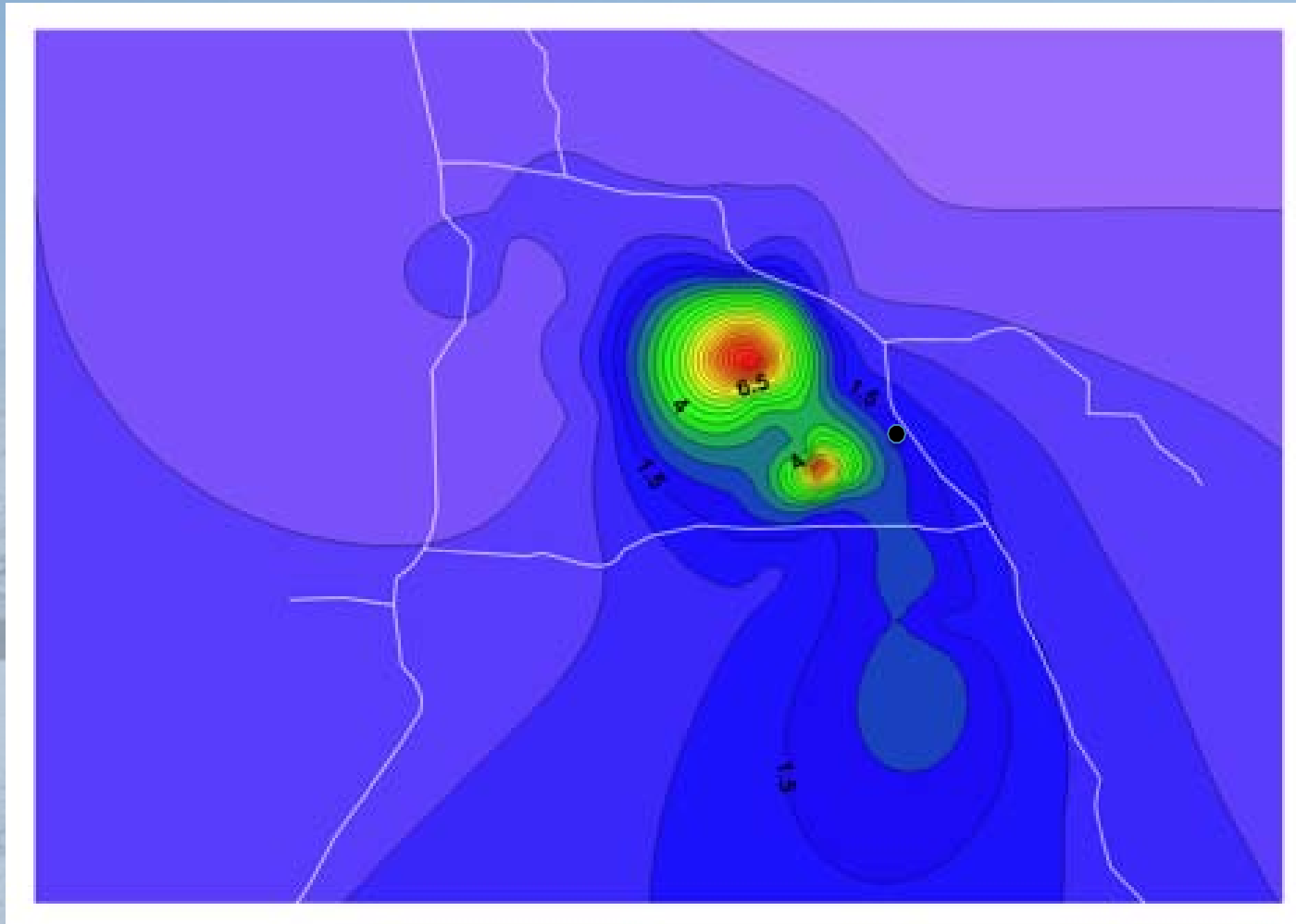


PMF Analysis performed by Dr. McCarty, Sonoma Tech.

BTEX Diffusive Spatial Surveys in UGRB



Toluene (ppb) 02/7 – 02/10 2012 in UGRB

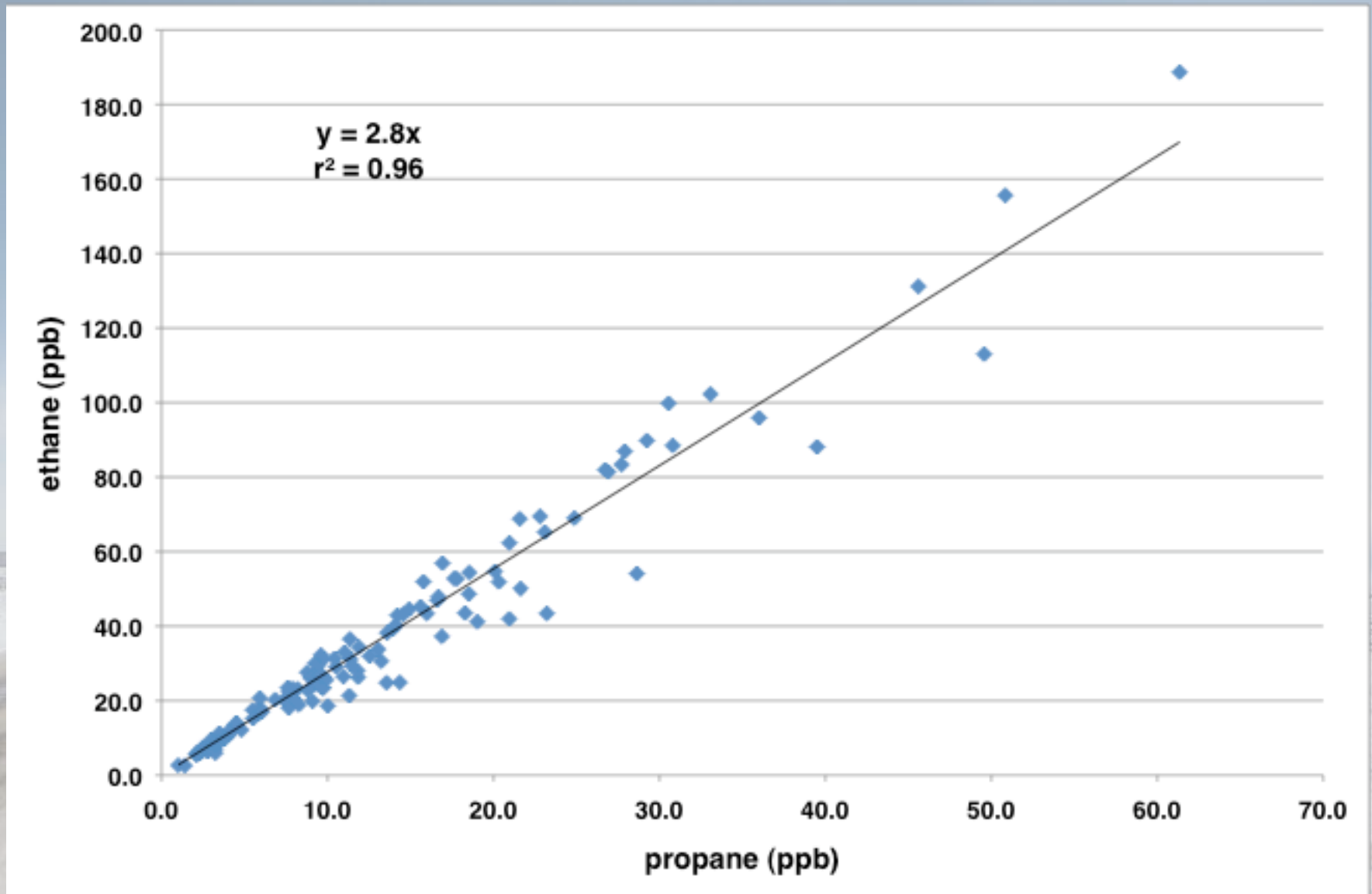


Twelve Canister Surveys 2012

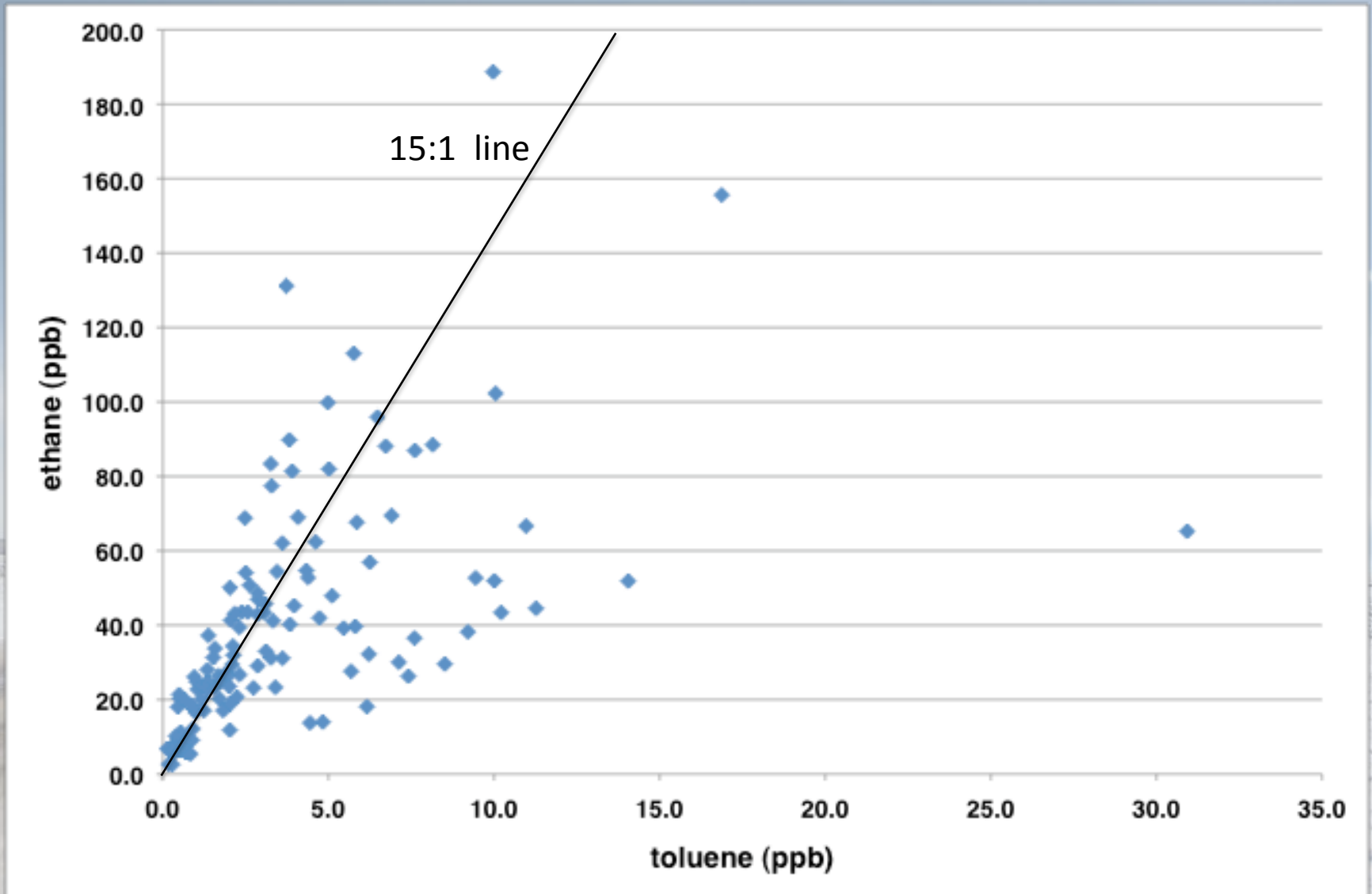
January to
March
encompassing
“ozone
season”



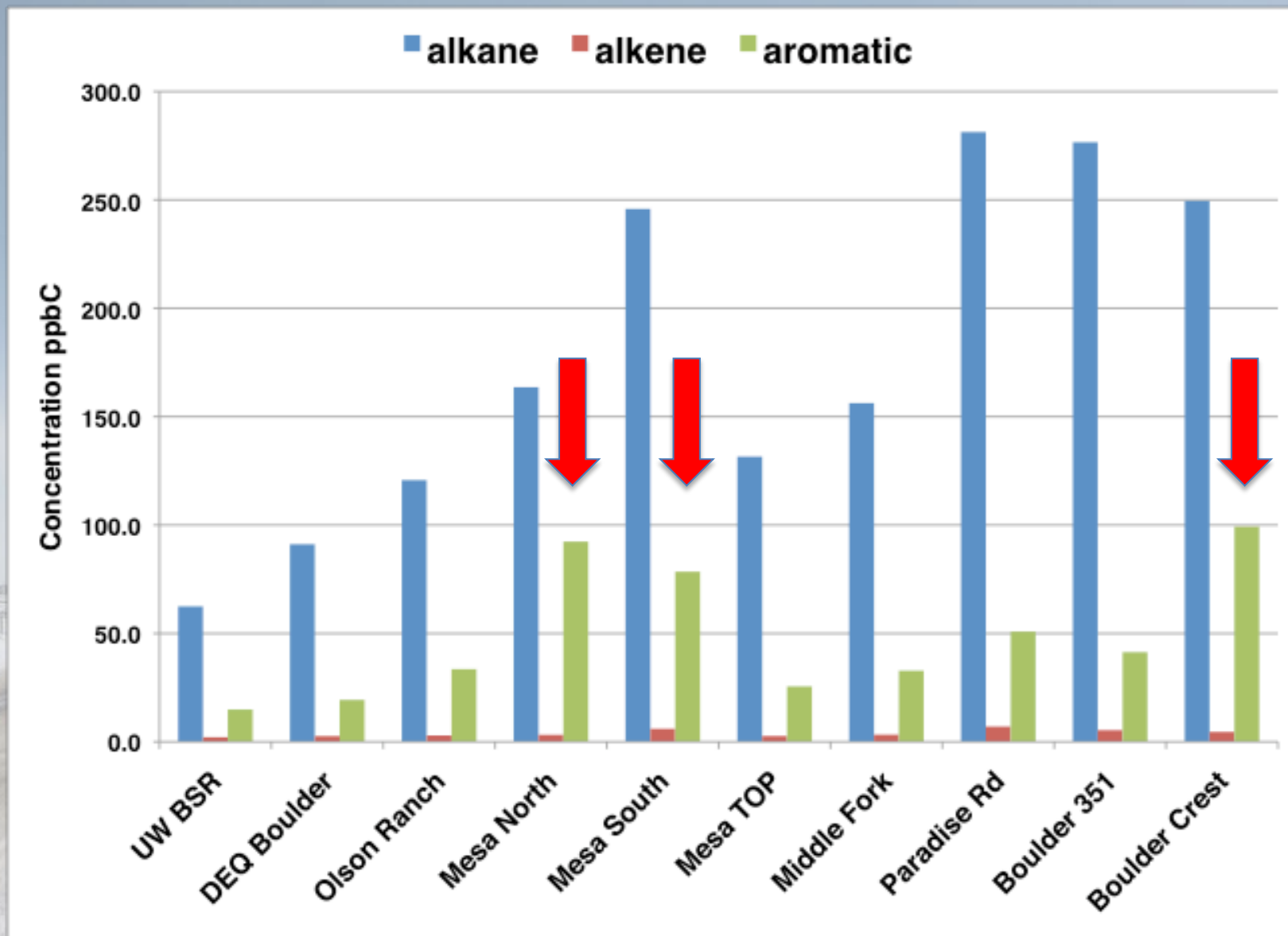
All 10 sites Ethane vs. Propane



All 10 sites Ethane vs. Toluene

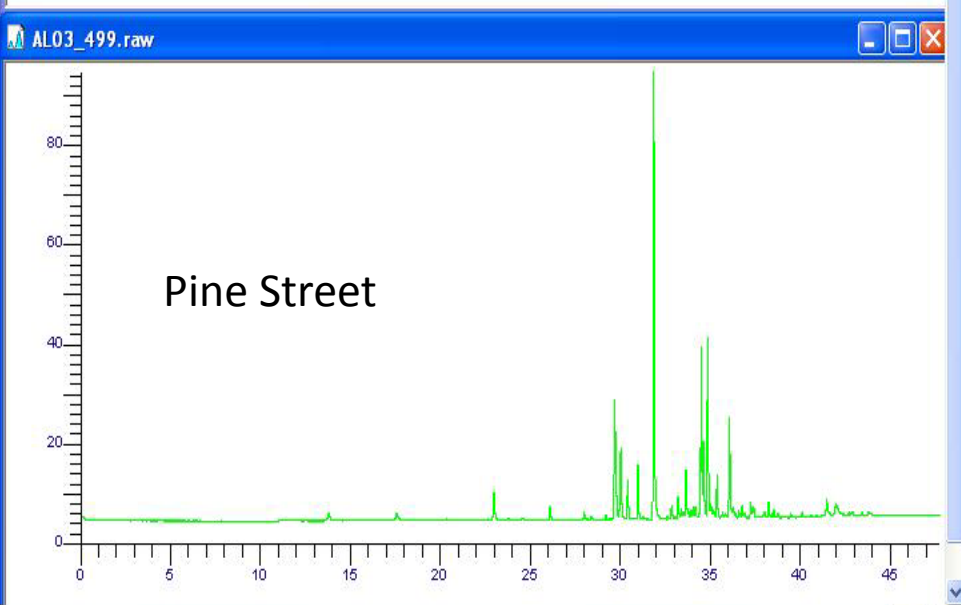
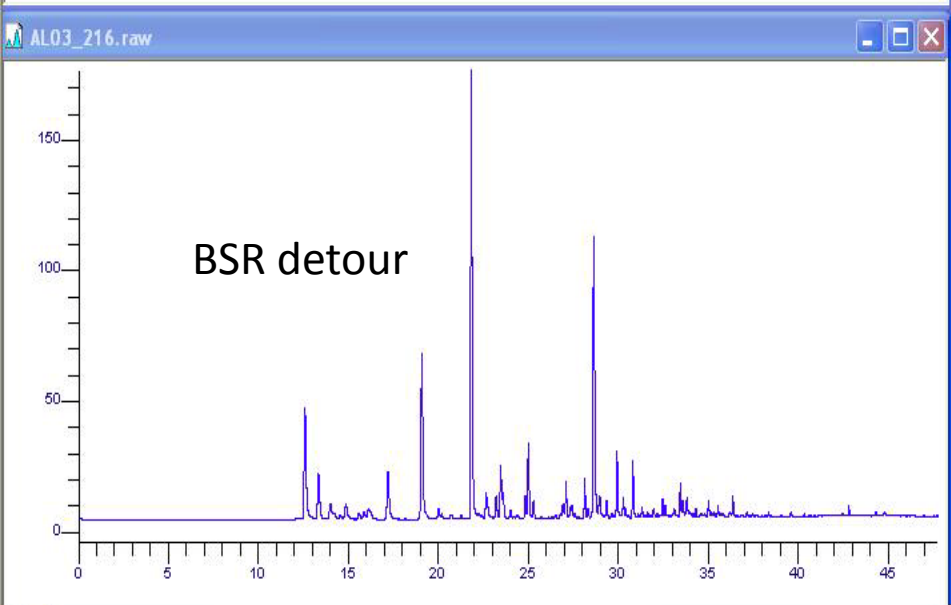
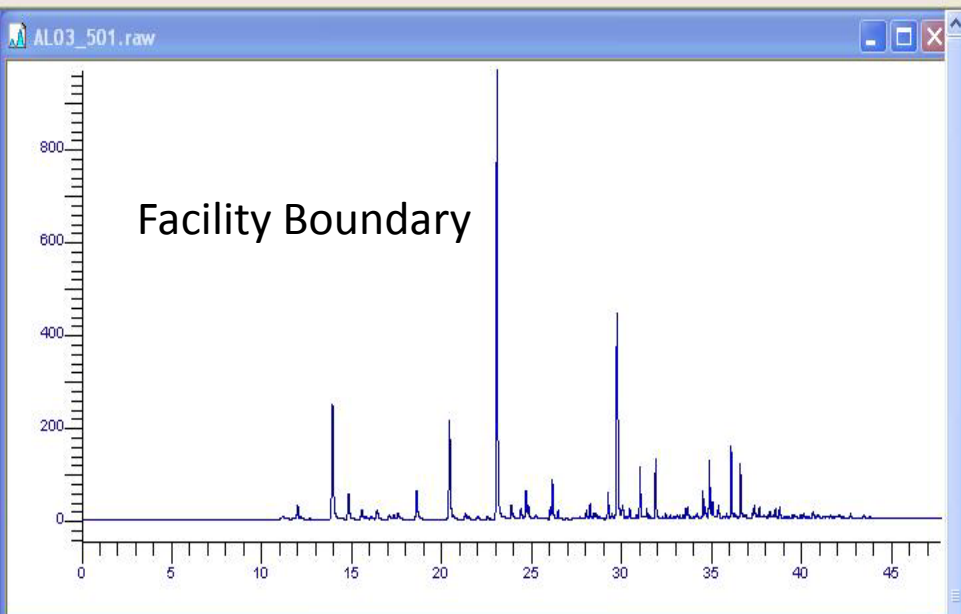
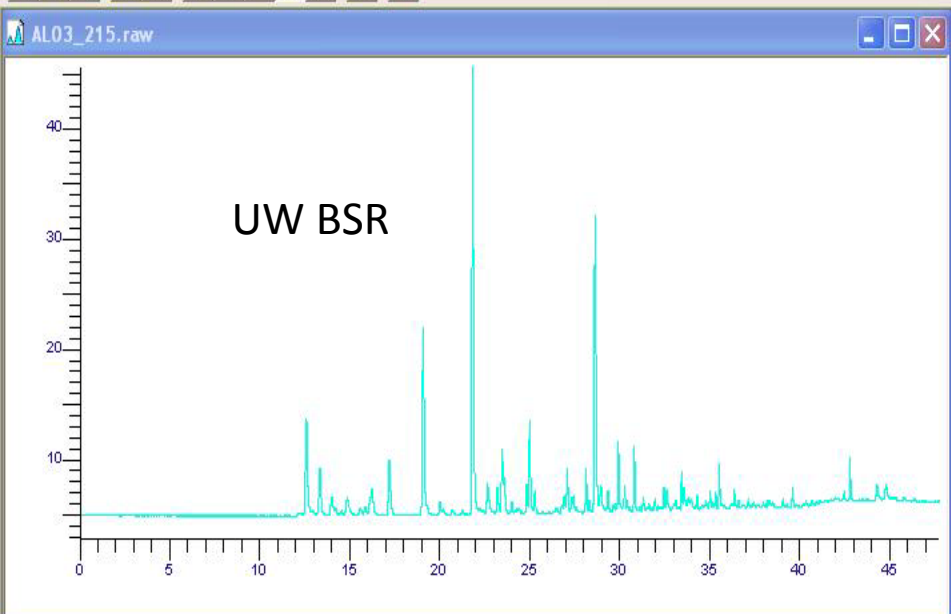


2012 Surveys VOC Distribution



UW Boulder South Road BSR





Water Treatment Facility



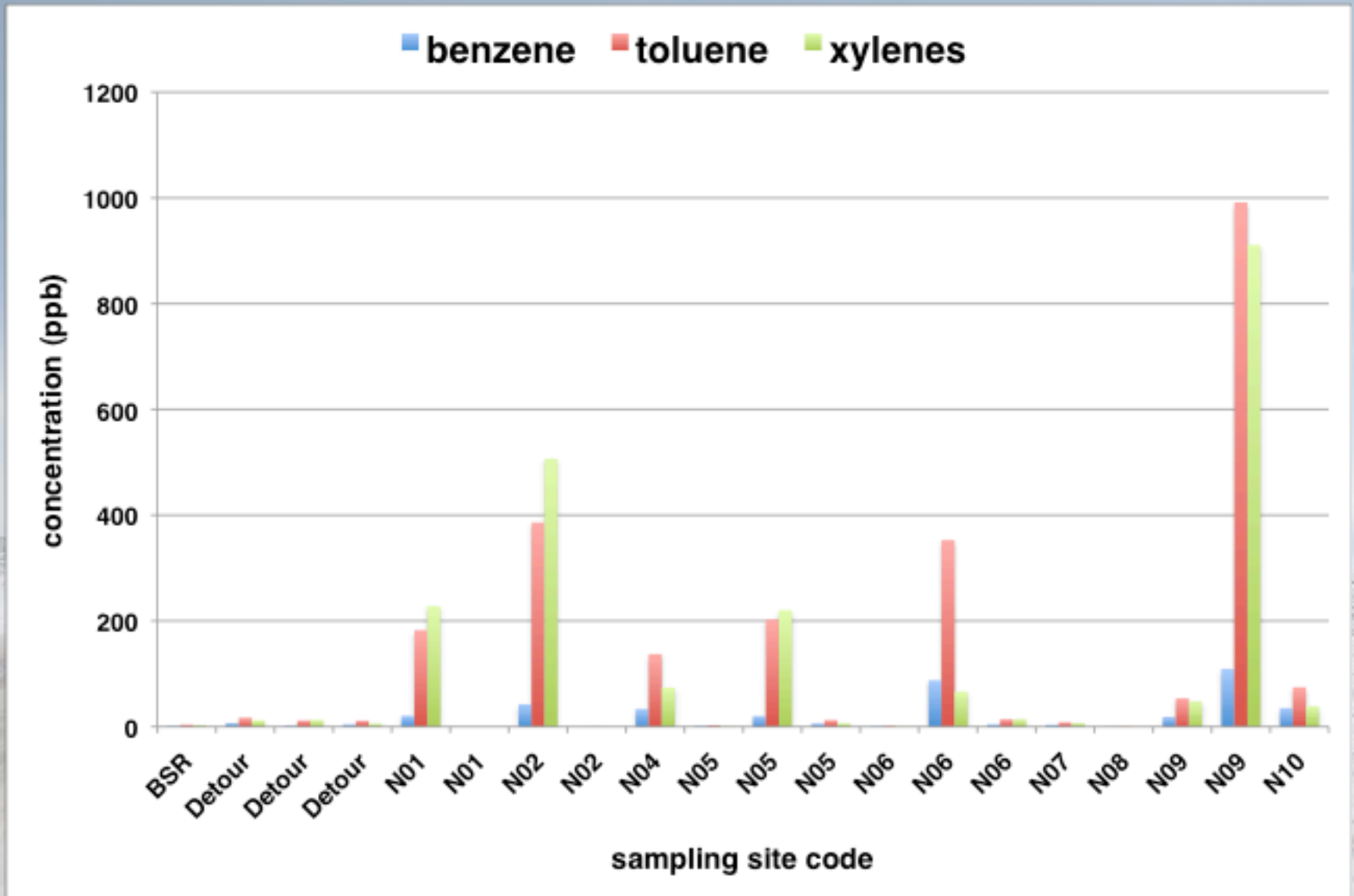
Pinedale Anticline Disposal facility

- Since 2006 over 20 million barrels processed
- Capacity of 60,000 barrels/day for processing and 20,000 barrels/day for discharge
- Typical Feed 28,000 to 80,000 $\mu\text{g/L}$ of BTEX

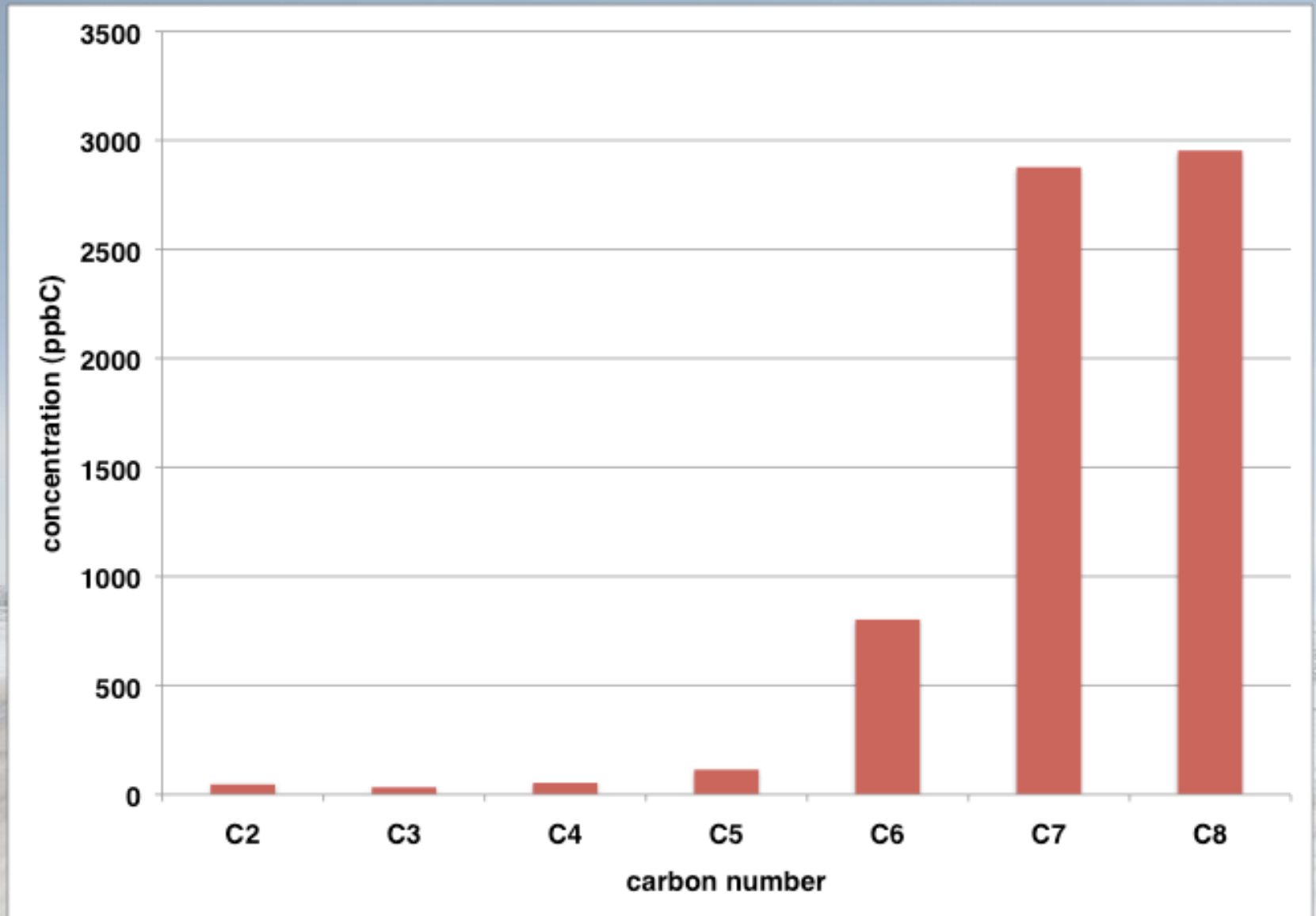
Anticline Disposal Facility Survey



Facility Survey Results



Treatment Signature



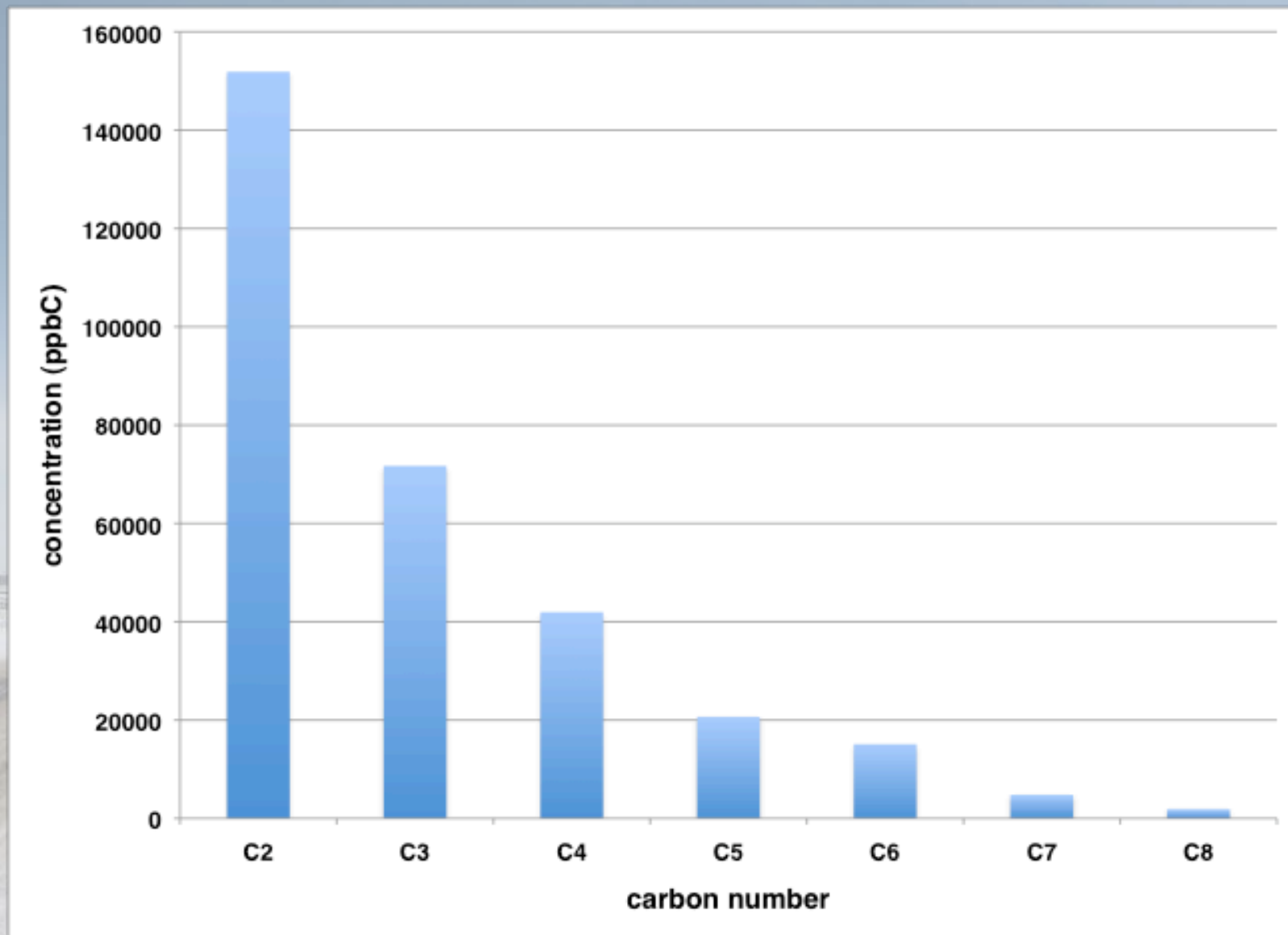
Production Emissions



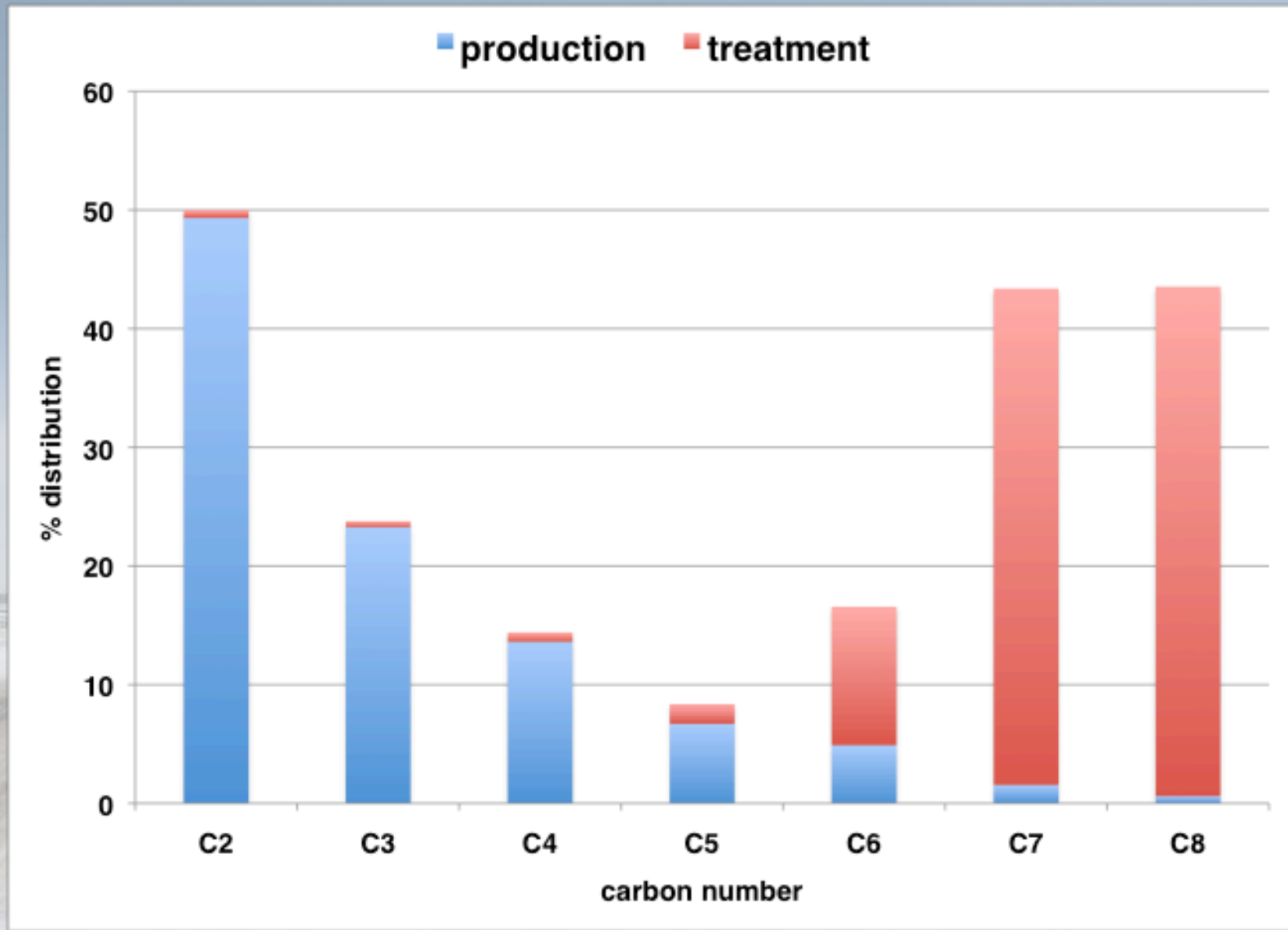
Pinedale Anticline Production

- Annual production of 500 million Mcf with ~2000 wells

Production Signature



Gas Production vs. Water Treatment



To conclude

- **Emissions from treatment of produced and frac flow back water are significant and merit further research**
- **Linked temporal and spatial campaigns provide a powerful combination for understanding pollutant behavior and emission distributions**

Proposed Research 2013 - 2015

With a new PTR-TOF-MS Mobile System

A step up built upon previous projects

Ambient Surveying:

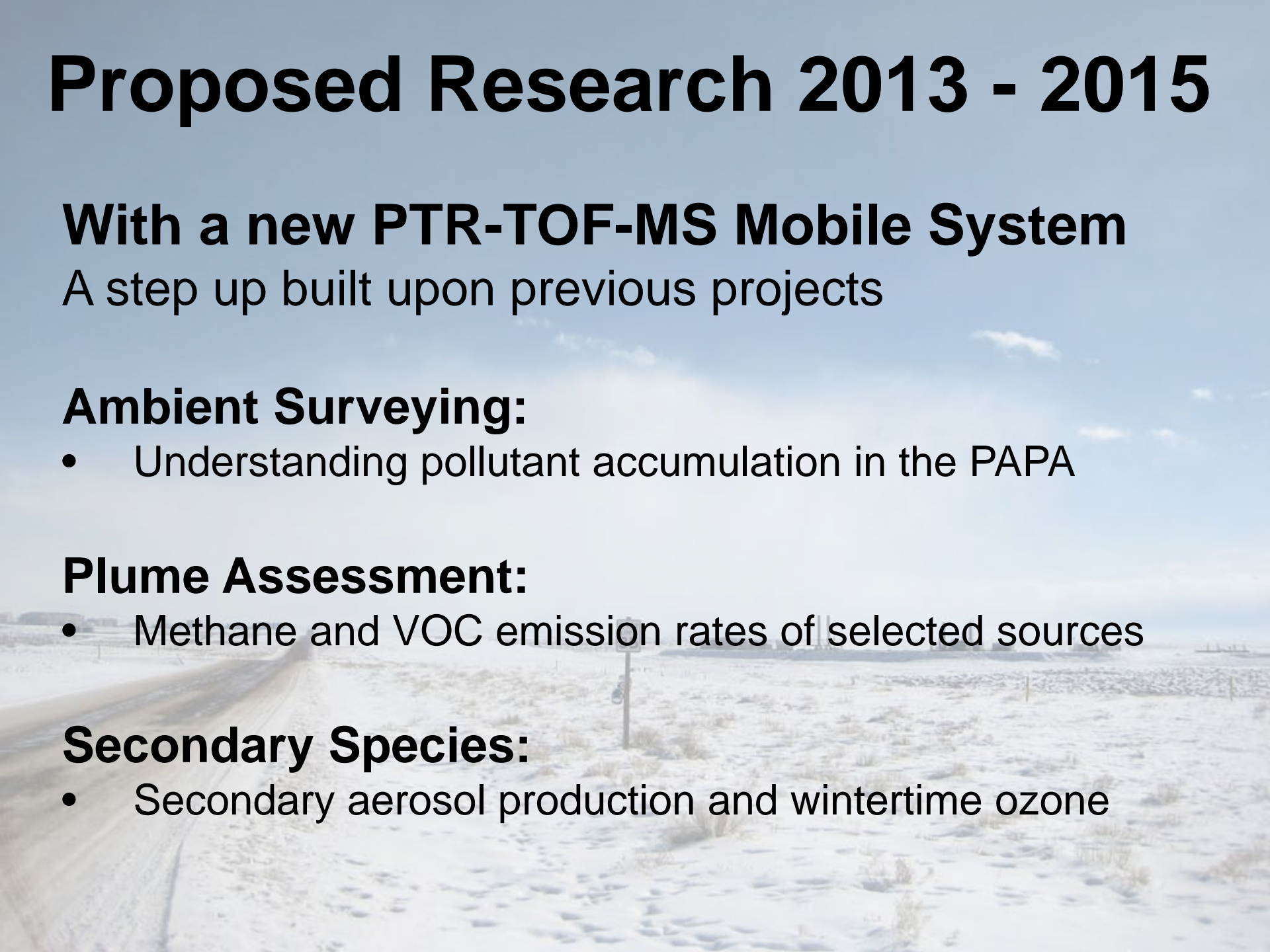
- Understanding pollutant accumulation in the PAPA

Plume Assessment:

- Methane and VOC emission rates of selected sources

Secondary Species:

- Secondary aerosol production and wintertime ozone



<http://www-das.uwyo.edu/ozone/index.html>



Thank You & Questions? (rfield1@uwyo.edu)